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Front cover: *Sarracenia leucophylla.* Originally photographed in southern Alabama, this stand is no longer. The site was successfully converted to a pitcher plant-free pasture. Photo by Don Schnell.

Rear Cover: *Sarracenia flava.* This is a nice stand of the red-tube, red-veined green lid form photographed in the Appalachicola National Forest in Liberty Count, Florida. Photo by Don Schnell.

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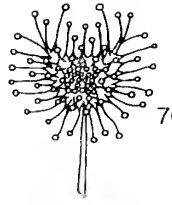
The Savage Garden

"The Potted Terrarium"



by
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The method of growing carnivorous plants in tanks is still one of the most popular and enjoyable ways to raise carnivores. Not only can a well done tank of flesh-eating plants rival a commonplace aquarium for decorative beauty, but the maintenance can be but a couple of hours a month or less, and unlike fish, you won't have to feed your plants every day. Also, tanks and terrariums can be kept almost anywhere in the home, school or office. I strongly suggest you consider cultivating the plants under grow-lights, which eventually will be the subject of another column. But suffice it to say that fluorescent lights are best for your typical terrarium, and two 48" tubes will make a four foot long shop-light fixture the perfect method of lighting a 55 gallon 'long' style tank. By using the excellent and inexpensive GE Plant and Aquarium Lights, available at discount places like Walmart or K-Mart, you can get a shoplight fixture and bulbs for less than $20.

There are several ways of growing CP in tanks. Although the classical terrarium may be the first to come to mind, this old-fashioned, soil at-the-bottom-of-an-aquarium style may not necessarily be the best. Although the classical terrarium may at times be aesthetically pleasing, it does have its drawbacks. For one thing, variety may be limited, since some plants may require a dormancy while others do not. Another problem is that some plants may spread through root or seed growth and become a weedy mess. Still further, setting up and redoing a terrarium can be a sloppy ordeal, and if one plant succumbs to disease or pests, the whole terrarium may soon follow suit. And finally, some of the plants you may wish to grow in your terrarium may require somewhat different cultivating techniques than others. A Mexican butterwort, for example, needs a somewhat drier winter and different soil than, say, *Cephalotus*.

Here I will discuss two "terrarium" methods, what I call the potted greenhouse-style terrarium, and the potted landscaped.

Potted Greenhouse-Style Terrarium

This is my favorite method of growing CP in tanks. Basically, you take an empty aquarium, sit fluorescent growlights along its glass-covered top, and you grow the plants in pots that sit in individual water saucers.

There are several reasons why this method is superior. The first is plant variety. Kept in individual pots and saucers, you can grow *Nepenthes* in their preferred soil mix, while rainbow plants grow along side in a completely different medium. You can grow temperate plants with the tropicals most of the year, but can easily remove a venus fly trap or purple pitcher plant during the winter and place them else where for their dormancy. Should aphids suddenly appear on a sundew recently added to the tank, it can be promptly removed and treated before the pest spreads to other plants. In fact, a simple way to control almost any pest that appears in a terrarium of this type, is to set a flea collar into the tank, making sure the collar doesn't come into contact with any water or soil. Flea collars in an enclosed tank will wipe out aphids, scale, mealybug, thrips and fungus gnat larva with minimal hassle.

Keeping the potted plants in individual saucers allows you to maintain the wetter/

drier cycle some plants may require, such as Mexican butterworts. Also, species such as *Byblis liniflora, Cephalotus,* and *Nepenthes* would not appreciate water-logged conditions all of the time.

But probably the biggest relief comes at cleaning time. If the pots simple sat in the tank, using the bottom of the tank as a water tray, large and heavy tanks can be an ordeal to clean when algae and splashed soil particles become unsightly. Using the saucer method will make cleaning the tank much easier.

Another benefit of the saucer method for the greenhouse terrarium is that lower-growing plants like rosetted sundews can be raised closer to the lights by placing the pot and saucer on an empty upside-down pot, or some other pedestal. Further, plants with larger drooping or pendulous leaves, such as *Drosera multifida* or *Nepenthes*, will be shown to a better advantage by raising them on a pedestal.

To make a potted terrarium more pleasing to the eye, be sure to use uniform pots and saucers of the same shape or color. Your basic round or circular green plastic pots work well here, or you may choose an opposite approach and grow the plants in a variety of ceramic, glazed pottery.

The Potted Landscaped Terrarium

This method is rather similar to the above except that the space between the pots are filled with fine orchid bark, lava rock, perlite, pumice or mosses to give the appearance that they are planted in soil. Long-fibered sphagnum makes a good medium to use for this method, and live sphagnum growing along the surface can be rather attractive. Trimming the live moss will be necessary to prevent it from overgrowing some of the shorter potted plants. One can also use orchid bark, pumice, lava rock or perlite as a base to hide the pots, with the sphagnum as a top dressing-although I must admit the whiteness of perlite may be distracting when visible through the glass. You can still keep the plants in individual saucers, but it is easier to set them on a base of moss or lava rock, raising or lowering this medium as would suit the plant's wetness or dryness requirements. The water table would be visible through the glass.

It can be fun to decorate a tank with this method. Raised pots of *Nepenthes* can be hidden with Spanish or sphagnum mosses, draped along the pot's exterior. Potted bog grass, orchids or ferns can make the tank more "natural". I like to set mossy branches, rocks and *Tillandsias* (bromeliad air plants) along the soil surface of such a tank, giving the appearance of a tropical jungle, even if the plants are not native to such an environment. Although lethal as a growing medium, decorative or green sheet mosses can be used as a soil dressing as well.

Some people fret over the feeding of carnivorous plants in the terrarium. Of course you could go through the hassle of feeding your plants live insects, and this certainly may be entertaining if such a tank were on display in an office or children's museum. But it is easier to occasionally mist the foliage of terrarium plants with a diluted fertilizer (a subject for another column) or you can go to your local pet shop and buy a vial of dried insects, like flies or musca larvae, and feed these to your Plants about once a month or so.

When plants are kept in individual pots in a landscaped terrarium, you have the advantage of moving them about as in the greenhouse-style tank. Cleaning out and re-doing the tank would be necessary every couple of years or so, and using a base medium of pumice or lava rock will last longer and cleaner than if you used pure sphagnum as a base.

There are four things to consider if you wish to make your terrarium easier to maintain and more attractive. One is to attach your grow-lights to a timer, so they will go on and off without your having to be around. The second is to keep your tank ventilated. This means having an air gap along the top of the tank of one to two inches, to allow good air circulation. A constantly steamed-up tank with an over-abundance of humidity and stagnant air is a sure invitation to mold and fungus. A third important suggestion is to line the back and sides of the tank with a reflective material such as mylar or white cardboard or mirrors. This will greatly enhance the strength of light

upon the plants and color them up beautifully. Some growers plan a removable reflector on the front of the tank, removing it when they are home or wish to view the plants. This will cause the light to bounce around the tank and the vivid colors of the plants, even some distance from the growlights, will take your breath away. Finally, I like to keep a spray bottle of purified water near the tank. Giving the terrarium a heavy mist in the morning and evening will increase humidity and circulate the air.

The following is a list of suitable plants for both styles of terrariums mentioned above. I will list here only warm-temperate, subtropical and tropical plants that don't require a dormancy in winter. If you wish to include such coldwinter plants like venus fly traps or purple pitcher plants, they are best removed between Halloween and Thanksgiving and placed in a chilly environment until around Valentine's Day in February, when they can be returned to the tank. The following plants do well at room temperature, between 50-60 F minimum and 75-85 F maximum. In order to trigger the seasonal growth habits of varieties like pygmy sundews or Mexican butterworts, I like to reduce the photo-period of the grow-lights to 12 hours in winter, increasing this to 16 hours by summer.

Most *Nepenthes*. If your house has cooler night temperatures stick with highland plants. Warmer nights 60 F and above are best for the lowlanders. *N ventricosa* is superb due to is shorter growth habit. Also good are *N. alata, tenticulata, glabratus, tobiaca,* and *ampullaria,* which can all be pruned severely when they get too large.
Cape sundews and rosetted sundews, such as *D. aliciae, spatulata, hamiltonii* and *capillaris.* Trim flower stalks to prevent seedlings from going wild.
Tropical sundews such as *D. adelae, schizandra, prolifera* and *petiolaris* as well as *D. anglica 'Hawaii'* and *intermedia* 'tropical form'.
Most pygmy sundews.
Forked sundews such as *D. multifida, extrema* and X 'marston dragon'
All Mexican butterworts.
Byblis liniflora.
Most *Heliamphora* species.
Cephalotus.
Subtropical terrestrial bladderworts, such as *U. sandersonii, livida,* and *calycifida.*
Tropical epiphytic bladderworts like *U. longifolia, alpina* and *reinformis.*

Nepenthes lavicola, a new species of Nepenthaceae from the Aceh Province in the North of Sumatra

by

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Summary:
A new species of *Nepenthes* (Nepenthaceae) from Gunung Telong, Aceh province, Sumatra, Indonesia is described and illustrated.

Introduction:

On a field trip in 1996 we had the opportunity to climb and explore Gunung Telong, a mountain of volcanic origin near Gunung Geuredong. Both mountains are located in the area of Lake Tawar near the city of Takengon in the north of Sumatra.
In 1931 FREY - WYSSLING (p. 46) wrote about his exploration of the mountain and also mentions *Nepenthes*, though he could not determine the species. TAMIN and HOTTA (1986, p. 101) list the plant as *Nepenthes singalana*.
On the open slopes of Gunung Telong we observed a very distinct species of *Nepenthes* which is new to science and hence is formally described in this paper.

Nepenthes lavicola Wistuba et Rischer sp. nov.

Folia mediocria, lamina oblonga-spathulata, nervis longitudionalibus utrinque 5, basi cordata in alas 2 decurrente, caulem 2/3 amplectente; Ascidia rosularum mediocria, globosa-urceolata, alis 2 fimbriatis; peristomio versus acuminato et elevato, antice 1 mm, operculum versus 4 mm lato, costis 0.5 mm distantibus, dentibus 2x longioribus quam latis. Operculo ovato-cordato, facie inferiore plano. Ascidia superioria magna, parte inferiore infundibuliformi-ovata, parte superiore cylindrica, costis 2 prominentibus, peristomio versus acuminato et elevato, antice 2 mm, operculum versus 6 mm lato, costis 0,5 mm distantibus, dentibus 2x longioribus quam latis. Operculo ovato vel ovato-cordato, facie inferiore plano.
Inflorescentia racemosa, pedicellis 5-10 mm longis, fere omnibus 2-floris. Indumentum parcum villoso-tomentosum.

Holotypus: Wistuba et Rischer No. 26032, vine with pitchers and fruits, G. Telong, 2000 m alt., Aceh, Sumatra, 26.03.1996 (L).

Stems climbing, up to 3m high, the part with adult leaves 4 - 8 mm thick, triangular to quadrate, the internodes 3 - 6 cm long; at the base of older plants there are often short shoots.
Leaves of the short shoots oblong-lanceolate contracted into a linear base, 5 - 12 cm long and 2 - 3 cm broad, apically acumianate, clasping the stem for 2/3 circumference with the rounded base, pennate nerves indistinct, 3 longitudinal nerves originating from the basal 1/2 part of the midrib, running parallel in the outer 1/3 of the lamina, often indistinct in less developed leaves. Tendril 1 to 2 times as long as the leaf and without curl.
Leaves of the climbing stems thin coriaceous, oblong-lanceolate contracted into a

linear base, 11 - 17 cm long and 2 -4 cm broad, apically obtuse, clasping the stem for 2/3 of circumference with the cordate base, shortly decurrent, pennate nerves indistinct, 5 longitudinal nerves originating from the basal 1/3 part of the midrib, running parallel in the outer 1/2 of the lamina, often indistinct in less developed leaves. Tendrils 1-1.5 times as long as the leaf, the pitcher bearing ones always with curl.
Pitchers of the rosettes abruptly originating, shortly incurved, short and wide, globose in the lower half to urceolate in the upper part, 5 - 7 cm long, 3 - 4 cm broad with two fringed wings over the whole length, the wings 2 - 3 mm broad, the fringe segments 3 - 5mm long, 1 - 2.5 mm apart, mouth almost horizontal in front, incurved towards the lid, elongated into a short neck, peristome flattened and 1 mm broad near the wing side up to 4 mm on the sides and near the lid, the ribs up to 0.5 mm apart, the teeth of the inner margin up to twice as long as broad, inner surface of the pitcher glandular in the lower half, glands overarched with about 200 per cm2 .
Lid ovate - cordate, the lower surface without appendage, glands ovate deepened, concentrated near the base.
Spur simple or bifurcate, 5 mm long, originating near the lid base.
Pitchers of the climbing stems abruptly originating from the hanging end of the tendril about 3 cm above the 1 - 2 cm wide curve, 11 - 16 cm long, slender, the basal part infundibuliform to ovate then ventricose 2 - 3.5 cm wide, slightly hipped in the middle narrowing to the somewhat waisted cylindrical upper part, the wings are reduced to ribs, rarely bearing few rudimentary fringes near the mouth.
Male inflorescence racemose, the peduncle 16 cm long, 5 mm thick at the base, the axis 20 cm long, pedicels mostly 2 flowered, 5 - 10 mm long, with 1 or 2 bracts, 5 - 10 mm long, narrow lanceolate, the lower part of the axis mostly bearing elongated bracts up to 3.5 cm long, tepals 3 - 6 mm long, elliptic, staminal column 3 mm long, the anthers included 3 - 5 mm long.
Female inflorescence racemose, the peduncle 20 cm long, 6 mm thick at the base, the axis 6 - 7 cm long, pedicels mostly 2 flowered, 8 -10 mm long, with 1 or 2 bracts, up to 1.5 cm long, narrow lanceolate, the lower part of the axis mostly bearing elongated bracts up to 7 cm long, tepals 4 - 6 mm long, elliptic, ovary sessile 4 - 5 mm long.
Fruit 2 - 3 times as long as broad, up to 1.8 cm long, valves up to 4 mm broad.
Seeds filiform, 1.2 - 1.4 cm long.
Indumentum on the stems none, the leaves with an increasing pubescence on the lower side of the midrib towards the leaf tip, tendrils and young pitchers densely covered with short hairs, inflorescence except the tepals densely hairy.
Colour of herbarium specimen: light brown, colour of living specimen: pitchers usually dark brownish purple to almost black, peristome yellowish green, sometimes with red stripes, occasionally colour of pitchers yellowish green with blackish spots, interior surface of the pitchers pale green, in the lower pitchers red spotted.

Distribution and ecology:
The plant is very common on open slopes above 2000 m altitude up to the crater (about 2600 m) in volcanic soil of Gunung Telong near Takengon, Aceh province, Sumatra. The open slopes originate from volcanic activity in more recent times (1856) and the species probably grows in suitable habitats on the whole Gunung Geuredong massif (G. Geuredong, G. Telong, G. Popandji). No other Nepenthaceae were observed on Gunung Telong.
It is very remarkable that no other *Nepenthes* species is so far known growing further to the north in Sumatra than *N. lavicola*. DANSER (1928, p. 400) already doubted the restriction of *Nepenthes* to the southern three quarters of Sumatra.

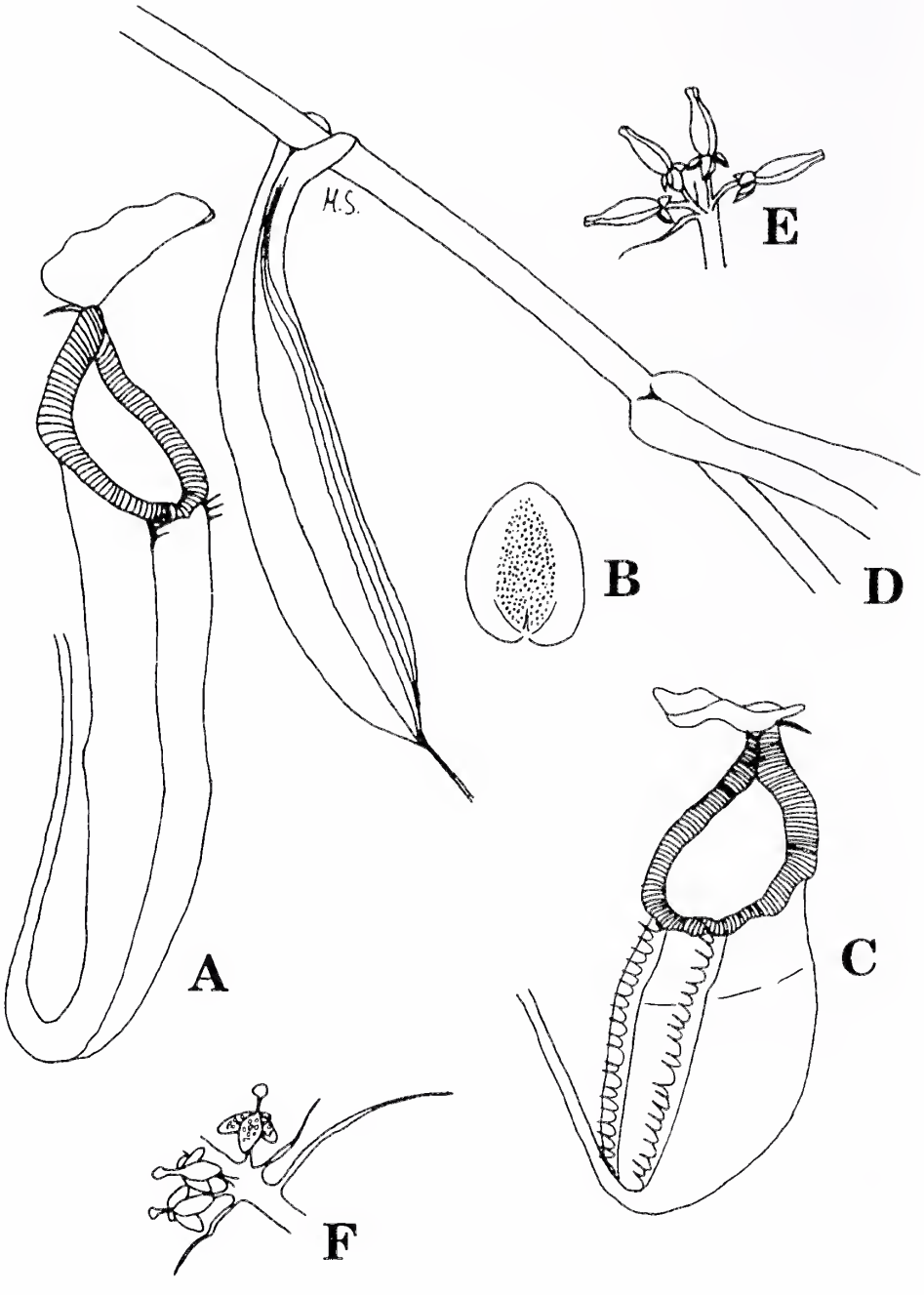

Figure 1. *Nepenthes lavicola* Wistuba et Rischer
A. upper pitcher. B. lower side of lid. C. lower pitcher. D. part of climbing stem. E. seed capsules. F. part of male inflorescense with long bracts.

Figure 2. developing male inflorescence

Figure 3. upper pitcher

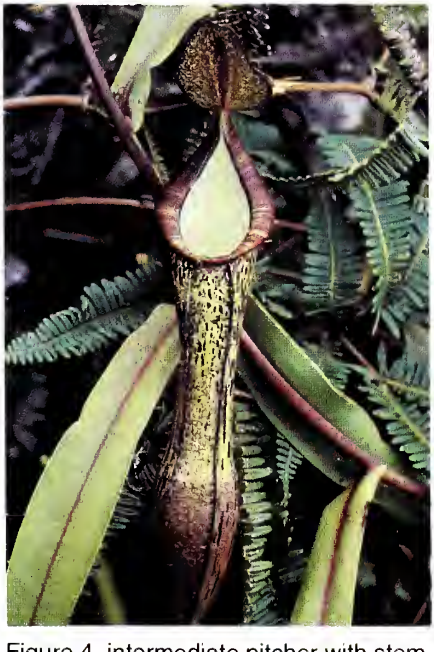

Figure 4. intermediate pitcher with stem

Figure 5. lower pitcher

Notes:
In Table 1 we show some characteristics which clearly distinguish *N. lavicola* from *N. spectabilis* Danser and *N. singalana* Becc., which seem to be related species. *N. densiflora* Danser also occuring in the Aceh province and *N. junghuhnii* nom. nud. exhibit characters which are less similar.
The epithet *lavicola* refers to the fact that this species was found growing on volcanic soil.

Table 1.
Characteristics of *Nepenthes lavicola* compared to the related *Nepenthes spectabilis* and *Nepenthes singalana*

	Nepenthes lavicola	*Nepenthes spectabilis*	*Nepenthes singalana*
Shape of lower pitchers	urceolate to globose	ovate in the lower part, cylindrical in the upper part	basal part infundibuliform, cylindrical in the upper part
Shape of upper pitchers	slender, lower part infundibuliform to ovate then ventricose, slightly hipped in the middle narrowing to the somewhat waisted cylindrical upper part	infundibuliform in the lower half, tubulose in the upper half	lower half infundibuliform, mostly ventricose in the middle, cylindrical or slightly narrowed towards the mouth
colour of the pitchers	usually dark brownish purple to almost black peristome yellowish green, sometimes with red stripes, occasionally colour of pitchers yellowish green with blackish spots, innerside of the pitchers pale green, in the lower pitchers red spotted	light green, with numerous longitudinal dark violett - brown stripes and spots	light green to dark red, violett spotted or not
lid	ovate-cordate	orbiculate	suborbicular, cordate at the base
spur	up to 0.5 cm in length, branched in case of lower pitchers	2 cm in length, simple	2 - 3 mm, slightly flattened, not branched

spur insertion	close to the lid base	5 - 10 mm below the lid base	close to the lid
floral bracts	bracts very prominent, usually overarching the flowers, some of the lower ones reaching several cm in length	pedicels bearing filiform bracts	male: filiform bract female: without bract
fruit	Fruit 2 - 3 times as long as broad, up to 1.8 cm long	very slender, 4-5 cm in length	up to 30 mm long

Specimens examined:

Nepenthes lavicola : all specimens collected within a 100 m radius of N 4°46.031′/E 96°49.130′/2375 m alt. (according to GPS data).

Wistuba et Rischer No. 26032 (f), holotype, vine with pitchers and fruits, G. Telong, 2000 m alt., Aceh, Sumatra, 26.03.1996 (L); Wistuba et Rischer No. 26031 (m), vine with male flower, G. Telong, 2000 m alt., Aceh, Sumatra, 26.03.1996 (L); Wistuba et Rischer No. 26034 (f), vine with female flower, G. Telong, 2000 m alt., Aceh, Sumatra, 26.03.1996 (L); Wistuba et Rischer No. 26033 (0), climbing stem with intermediate pitchers, G. Telong, 2200 m alt., Aceh, Sumatra, 26.03.1996 (L); Wistuba et Rischer No. 26035 (0), short stem with lower pitchers, G. Telong, 2300 m alt., Aceh, Sumatra, 26.03.1996 (L).

Nepenthes densiflora: C. G. G. J. van Steenis No. 8331 (f), isotype, Poetjoek Agoesan, biv. 1 tot 2, 2350 - 2400 m, 28.01.1937, H. L. B. 957.96.944 (L); (f/m)
H. L. B. 957.96.945 (L).

Nepenthes junghuhnii: Sumatra (s. loc.), Junghuhn s. n. (K).

Nepenthes singalana: Bünnemeijer No. 9997, G. Koerintji, alt. 2600 m, 04.05.1920, H.L.B. 928.350 - 169 (L); Meijer No. 3590, Mt. Sago, northern slope, open facies, mossy forest, Payakumbuh, 1800 - 1900 m, 29.06.1955 (L); Meijer No. 5841, Mt. Singgalang, surrounding of crater lake, subalpine veg., 2800 m, 26.05.1957 (L).

Nepenthes spectabilis: Lörzing No.7308 (f), type, G. Sibajak, 1800 - 1900 m, 05.06.1920, H.L.B. 928.350-170 (L).

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We would like to thank Dr. Jan Schlauer for his critical reading of this paper, Dr. Joachim Nerz for helpful general discussions about *Nepenthes*, Matthias Schmidt for preparing the illustration, Mr. Andi Adek from Padang, West Sumatra without whom many field trips to *Nepenthes* locations involving ourselves and Dr. Joachim Nerz, Böblingen, would hardly have been possible and the staff of the Rijksherbarium Leiden and Royal Botanic Gardens - Kew.

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Two Interesting Mexicans: *Pinguicula acuminata* and *Pinguicula macrophylla*.

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Introduction:

In recent years there has been a growing interest in the cultivation and study of the genus *Pinguicula* culminating in the formation of the International *Pinguicula* Study Group. Although these plants are not the most gruesome of carnivorous plants, the flowers of this genus are surely among the most beautiful. To fuel the increasing interest in this genus, there have been many new species introduced into cultivation in recent years. Among these have been two plants, *P. acuminata* and *P.macrophylla* - which although not closely related - are remarkably similar to one another when not in flower. In some circles these are considered to be difficult plants to cultivate - if not nearly impossible. This reputation (which I consider to be unfounded) may be offputting to some growers which is a shame as both of these species are very attractive and interesting plants. Although it is true that the cultivation of these plants requires some care (particularly during the winter months), the attention that the plants require is offset by the rewards of the beautiful flowers and striking foliage of these two species. The purpose of this article is to describe these two stunning *Pinguiculas* and to comment on my experiences of cultivating these species over the past few years. Hopefully, this article will provide encouragement for other growers to try these plants.

Figure 1. *Pinguicula acuminata*. Note white flower, acute spur angle, and that the flower appears to arise directly from the soil due to the buried winter leaves. Photo by Loyd Wix.

Figure 2. *Pinguicula macrophylla*. Photo by Loyd Wix.

Taxonomy:

As I will discuss in due course, these two plants are very similar to one another when not in flower and could easily be confused. Despite these similarities the two plants are not closely related. The Genus *Pinguicula* is separated into 3 subgenus, *Isoloba*, *Temnoceras* and *Pinguicula* - these subgenera are further divided into 14 sections and 14 sub sections. The two species of interest in this article are positioned as follows:

Species	Subsection	Section	Subgenus
P.acuminata	*Isolobopsis*	*Heterophyllum*	*Isoloba*
P.macrophylla	*Caudatopsis*	*Orcheosanthus*	*Pinguicula*

This positioning puts *P.acuminata* alongside the spidery *P.heterophylla*, and the semi-succulent *P.rotundiflora* and *P.reticulata*, and *P.macrophylla* alongside *P.oblongiloba* (and other members of the *Orcheosanthus* familiar to many of us, *P.moranensis* and *P.zecheri*).

Descriptions:

Foliage:

P.acuminata and *P.macrophylla* both have similar patterns of growth and similar foliage. Both plants display quite different winter and summer foliage with distinct differences between the first leaves formed in spring/early summer, and those formed during the height of summer. The summer leaves are best described as heart or spade shaped with long petioles for the most part buried below ground together with the growth point. The first leaves of the year are relatively small showing the greatest amount of petiole above the surface of the compost. The leaves in late summer are 3 to 4 times larger and often conspicuously veined. Towards the end of the season when the production of summer leaves has stopped, the development of the winter rosette is indicated by the presence of a void in the centre of the summer rosette. This is similar to the signs indicating the formation of winter resting buds in European *Pinguicula* such as *P. grandiflora* and *P. leptoceras*. At this time careful inspection will reveal the presence of the developing winter rosette. Both species produce buried almost bulb like winter rosettes which I find reminiscent of the hibernacular formed by the European species. In my experience the winter rosettes of *P. macrophylla* are buried deeper the those of *P. acuminata* and resume summer growth later. The winter rosettes are composed of many small, pointed succulent leaves and the rosettes can be as much as 2cm in diameter.

Flowers:

Both species are easily distinguishable from one another in terms of the shape and colour of the flower and the time of flowering.

P. acuminata - this plant only flowers from the winter rosette in late winter and early spring and never from the summer rosette. So this is another of the very welcome winter flowering species that help to brighten up other wise dull and short days. For me the most fascinating aspect of this plant is how the first flowers emerge from the winter rosette before the summer leaves start to be formed. Bearing in mind how the winter rosette is buried, then the first flowers are produced with no other physical signs of a plant being present in the pot. The flowers are a pale lilac colour with a very

distinctive spur which is short, green in colour and bent 90 degrees to the corolla tube. When the flowers first open, they are a very pale colour (often almost white) with the lilac colouring developing as the flower ages. Large plants can bare up to 6 flowers in one season. The last flowers of the season are produced as the new spring foliage starts to emerge. The scape is quite smooth and carries relatively few glands (although many are present on the flower) and these are confined to the upper most portions. Some plants bear flower stalks that are coloured brightly red, which I find reminiscent of the coloured inflorescence of *Heliamphora nutans*. In other plants the flower stalk is a paler apple green colour.

P.macrophylla - this plant never flowers from the winter rosette, and only flowers in mid summer. Fewer flowers are produced in a season by comparison with *P.acuminata*. The colour of the flowers is a dark violet/purple with a white splash on the lower petal - not untypical of other plants in Section *Orcheosanthus*. What is distinctive is the pronounced rounding of the petals - which in other *Orcheosanthus* plants tend to be angular such as in the various *P.moranensis* forms. By comparison with *P.acuminata* the spur is long and straight.

Cultivation:

The current wisdom on the cultivation of Mexican Pinguiculas advises the use of an open free draining compost composed principally of perlite, vermiculite and sand with comparatively low levels of organic material such as moss peat. Such open and aerated composts lead to the formation of a strong and healthy root system, by comparison heavy composts rich in peat lead to restricted root systems and stunted plants. Thus it will not be surprising that I grow both of these plants in a compost rich in perlite and vermiculite.

One aspect of *Pinguicula* cultivation that has bothered me for a while has been the selection of suitably sized pots. The main difficulty has been accommodating the summer rosettes which have a habit of growing over the sides of the pots. Pots with a large enough diameter for the rosettes are usually so tall as to produce an unbalanced effect when planted with such low growing species. As a result, most of my plants are now planted out in terracotta bowls, with several plants in each bowl (such bowls are sold in the UK for planting bulbs such as Hyacinths). Individual plants are placed in attractive clay half pots which have a wide enough diameter to accommodate the largest summer rosettes, whilst the depths of these half pots produces a balanced effect. I also use a top dressing of fine pea gravel which hides the artificial looking perlite and keeps moss growth under control as well as looking attractive.

When the plants are in full growth during the summer, they enjoy regular and frequent watering. Once the winter rosette is formed it is vital that the pots are kept drier. If over watered at this time of year there is a real risk of the plants rotting. I used to keep all such plants totally dry over the winter months, though beware as I lost some plants potted up in clay pots last year which I believe was due to the plants becoming totally desiccated. (Clay pots allow the compost to dry out much faster than plastic ones). Just because the plants are in a winter rosette does not mean that the plants are fully dormant and thus although greatly reduced, there is still some requirement for moisture. This is where the greater care is involved in cultivating these plants. On the one hand it is important to avoid growing these plants wet during the winter, but also equally important that desiccation of the plants does not occur due to neglect (It is easy to just glance by pots of these plants with out another thought as the plants are hidden below ground). In late autumn/ early winter it is advisable to remove all dead leaves as these can become a source of infection.

Propagation:

Both plants can be propagated by either leaf cutting or seed. To produce leaf cuttings, leaves are taken from the winter rosette so it is necessary to partially excavate this sufficiently to enable winter leaves to be removed without unnecessary damage occurring to the parent plant or root system. Leaf cuttings should be placed on to a similar open compost as the parent plants are grown in. Leaf cuttings will form reasonable sized plants after one season.

Seed of both species can be generated, though some intervention with a fine water colour brush (or other similar implement) is necessary. Seed should be sown on a very open compost - not only for root development, though because these open sandy materials do not harbour Sciarid (mushroom) fly larvae that can decimate the seedlings. Seed is a slower method over cuttings to achieve adult plants.

Conclusions:

Both of these plants are worthwhile additions to any collection whether for the flowers or the foliage of the summer rosettes. The chief attraction of these two plants is how different they are in comparison to the species of *Pinguicula* more commonly grown. Whilst the cultivation of these plants requires a little more care than other plants in the genus, the beauty of these species makes this extra care justified. These plants are in addition worthy candidates for hybridisation in order to produce outstanding new hybrids in terms of leaf shape as well as flower.

How to Grow *Darlingtonia Californica*

by

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Darlingtonia californica, otherwise known as the cobra lilly, or cobra pitcher plant, is one of the most interesting looking carnivorous plants. This is paying the plant quite a compliment, as the beauty to be found among the many different species of carnivorous plants is extensive. It is surprising therefore, that many hobbyists do not include it in their collection. The answer to why they do not is because the plant can be challenging to grow. The challenge arises because it is one of a few carnivorous plants that requires different conditions from most of the others typically found in carnivorous plant collections. Unless these conditions are met, it is a difficult if not impossible plant to grow. After a few years of experimentation, and assistance from an expert, I have determined a way to successfully and easily grow this spectacular plant.

When attempting to cultivate any organism outside of its natural habitat, it is important to understand the general conditions of the habitat. *D. californica* (according to Peter D'Amato) grows along streams and seeps from sea level to high elevations in the northwestern United States, where the water temperature never exceeds 50 degrees, and the air temperature may often be in the 90s. The roots always stay cool, and the night temperatures drop into the 50s. Unlike its cousins the *Sarracenia* species, however, Darlingtonia does not tolerate warm root temperatures.

In its native mountain habitat, Darlingtonia grows in a sandy/coarse gravel medium where there is always a flow of water running over the roots. Peter said he never saw any growing in a mossy situation where one might see *Sarracenia* growing.

What Did Not Work

Some of my trials with the cobra pitcher that were unsuccessful were instrumental in helping me discover what would work. I made the mistake of growing Darlingtonia with my Sarracenias, (both local nursery stock) which are full sun, warmth-loving plants. At the advice of the nursery, I grew them outdoors in large clay pots sitting in water in a mostly peat moss medium. The metro Washington, D.C. summer can reach high 90's for extended periods of time. The cobras lasted only two weeks before getting fungus infections or withering. This was early in my carnivorous plant adventures, even before I owned any good books. I purchased a book or two, which pointed out that darlingtonia preferred cooler temperatures. So, I tried again, with the same nursery stock, only this time I grew them in more water and in a larger pot in the shade. The same result ensued.

I then tried again with the same arrangement indoors and in terraria. The plants lasted a little longer but succumbed to the fungus. I also noted that the plants I were using had little to no root system. This is common through retail sales-Darlingtonia reproduces asexually through a stolon that produces new plants. These stolon-born plants are severed and sold with little root development. Although this was a major

problem I identified, it was not all of the cause for my dismal failures with the plants. I tried with high quality mail-order plants that were healthy and had well developed roots. They lasted longer than the others, but even indoors they did not prosper and would rot and die within a short time of their arrival. I truly wanted to succeed, so I decided to call the aforementioned expert for advice.

What Worked

Peter described in detail how the plant grows and made recommendations as to how to grow them in captivity. Here is what he told me:

Medium:	Pure perlite or 50% perlite/50% sphagnum. He said the plants do not grow in peat moss any where that he has seen, but can have decomposed vegetation in the soil.
Water:	Overhead with chilled water one-two times daily. A deep saucer can be used under the pot to collect water to a few inches in depth.
Light:	Filtered, window sill light.
Temperature:	Chilly! Avoid temperatures above 60F, air temperature, 70-75F.

I placed six plants in pure perlite in a large clay pot with a large saucer underneath over an air-conditioning vent in the floor, directly in front of a full length window. The window received 3-4 hours of morning sunlight a day. The medium temperature never got above 59 degrees F. The culture was watered overhead daily no less than 2 times a day with refrigerated distilled water with two capfuls of Superthrive diluted per gallon. The amount of Superthrive may seem excessive, but since the medium was so well-drained, I thought a higher concentration was necessary on a run-through basis. Once a week, I would inject a drop or two of 1/4 strength solution of Muracid into the mature pitchers. This procedure is not necessarily the standard, many growers preferring to mist the leaves, but I found it be effective as an alternative to collecting the bees and wasps that Darlingtonia reportedly attracts as prey!

The plants were grown in the open with no provisions made with regards to the humidity level and were rarely misted. Although the pitchers on the plants when they arrived "burned" a little from this, the plants sent up new leaves and prospered all spring/summer long. One or two of the plants even produced plantlets from stolons.

Having succeeded in the growing season, the only hurdle to cross was dormancy.

Dormancy

My plants started to slow down a little toward the end of October, and by early November were apparently not growing anymore. I had moved them off the vent in late September because the air-conditioning vent was then a heat vent. They were placed on the opposite side of the window where heat loss through the window kept the plants cool. I understand the plants can sustain below zero in the winter and are dormant in these colder temperatures for anywhere from 4-5 months. This, of course, was impossible indoors. Rather than risk all my hard earned specimens outdoors, I divided my six plant culture into three groups of 2. The first went outdoors, the second into the

refrigerator, and the third stayed in the pot.

The first group was placed outside in a pot in the same medium, and mulched over with leaves, bark etc. and set against the house where harsh winds would not affect them. Metro D.C. winters can get as low as the teens and as high as the low 40'sF with occasional light to heavy snow. This method was not successful. After about one month, I noted the plants were brown even into the rhizome. Upon closer inspection, I declared the plants dead. There was insufficient moisture in the winter air to keep them hydrated and they froze solid one or two times. The overall effect was "freeze drying". I would not recommend this method in areas with harsh winters.

The second group was uprooted, soaked in fungicide for 15 minutes, wrapped tightly in live moss, and placed into a zip lock freezer bag which was placed into the refrigerator. The temperature measured a steady 35 degrees F. I checked them weekly (through the bag) for signs of disease and/or stress. The plants were evergreen through two months. At the third month (February) I noted the rhizome of one turning brown, and the other showing signs it was not doing well. I retrieved them from the bag and inspected them more closely. One of the plants was declared dead, and the other distressed. I placed the distressed plant in a strong solution of Superthrive for 30 minutes and placed it with group three. Although many growers use this method, I do not recommend it. I theorize the plants do not like being uprooted and subsequently thrust into a different environment so suddenly.

Group three was left alone...basically. They were left in their pot by the window. I did place the pot and saucer inside a clear plastic garbage bag to protect them from the dry indoor winter air and watered with distilled water occasionally to flush the medium and keep the roots clean. The plants made it. They have signaled their awakening in early March by sending up flower stalks, and will be moved back over their air-conditioning vent when the weather dictates that we turn it on. The plant from group two in this pot is alive, but far from prospering. I water the complex daily with my Superthrive solution overhead and have started fertilizing the pitchers. I will remove the bag (gradually) when ambient humidity increases to an acceptable level.

The major points to consider when growing the cobra lilly are the following:

- Purchase established plants from a reputable dealer.
- Grow the plant indoors.
- Keep the plant cool- especially the roots- never above 60F or so degrees. Grow in a coarse medium (1/2 moss, 1/2 perlite), where the roots have access to aeration, and water frequently overhead with cool distilled water.
- For dormancy, leave the plants in their pot and place the pot where cooler winter temperatures can be used to leech heat away from the plants (directly against the glass in a window sill is perfect.) Cover the plants in a clear bag to protect from dehydration.

Darlingtonia can be a very rewarding plant to grow with an understanding of the plant's special needs. Once these are taken care of, the plant does very well with standard maintenance. Hopefully, those growers who were having trouble can benefit from my experiments and establish this plant in their collections for their own enjoyment and the plants'-- *D. californica* is not as plentiful in the wild as it once was.

Special thanks to Peter D'Amato for his help with growing D. californica, and editorial help with this article.

Darlingtonia

by

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I always thought it was difficult to grow *Darlingtonia* here in the Livermore valley because its so hot during the summer season. As most of you know, this plant needs cool roots in order to survive and this is the challenge for any grower to provide. In nature, the coolness comes from the water that emerges mostly from underground aquafers which we call springs. This water is cold, usually emerging from the ground at about 50 degrees F(10 degrees C). This water sometimes flows quite rapidly down a slope and slowly warms up in the sunshine until the temperature reaches about 65 degrees F(18 degrees C). At about this point the *Darlingtonia* plants disappear from the fen indicating that the water has reached a temperature that the roots cannot tolerate. When I say roots, I also refer to the stolons which the plant uses to reproduce itself from the mother plant. A healthy mother plant produces 3 to 5 of these each year. The terminal tip grows away from the source plant and when somehow it knows what the right distance is, the tip enlarges and grows into another full size plant. This stolon also produces roots to support the new plant. This process might also need cool soil conditions.

I also saw *Darlingtonia* growing by a lakeshore where the lake was located near the Oregon coast where it is cool and the water is at that temperature as well. The plants grew only about 4-6 inches(10-15cm) above the water line and about 3-4 feet(1 meter) from the water. It was easy to surmize that the soil was saturated with the cool lake water and the roots were surrounded with this coolness.

So, *Darlingtonia* would be easy to grow like *Sarracenia* if it didn't require the coolness around its roots. However, one additional property of *Darlingtonia* is that it loves water and plenty of it. In many places that I have seen it grow it seems to be a semi-aquatic plant sometimes floating on shagnum moss mats in flowing water. Other places, I have seen it partially submerged and looking good and healthy. The roots seem to like free flowing water and there is no danger of rotting the roots by submerging them for long periods of time in deep pools of water.

So my method for growing these plants involves plenty of water which I use to cool the plant roots as well as nourish its appetite for water. Essentially, I use 5-inch(13cm) pots for each plant and I use materials that will not easily go to mush in the presence of so much water. The bottom half of the pot is filled with perlite while the top half is filled with live sphagnum moss. The pot (usually I have about 5 or 6) is put into a large tray with the dimensions of 18 inches by 24 inches and 4 inches deep(45cm x60cm x10cm). I keep the water in this tray filled to the top at all times. A little less in winter with the tray about half-full.

Since my trays sit in an unheated greenhouse with the plastic roof allowing about 50% sunlight through, the water doesn't heat up as fast as it would if it was sitting outside in full sunlight. I also have good ventilation by a fan in the summer so heat doesn't build up. If you need to, you can fill 2-liter cola bottles with water and freeze

them and they can sit in the tray in the background keeping the tray water cool. I find that evaporation off the large surface area and a fan will keep the water at a cooler temperature that Darlingtonia seems to like. The cool nights here will cool the tray water even more. *Darlingtonia* can also be grown in large tubs such as deep dishpans made by Rubbermaid which could withstand the weather and sunshine over long periods of time. Again, I use perlite mostly for the soil and I hold it down from floating with a 3-4 inch(8-10 cm) layer of live sphagnum moss. I flood the tub with water and try to maintain some free water sitting on the surface. The tub sits in my yard and gets about 2 hours of east morning sun only with the rest of the day in shade. The plants are healthy and I will be getting some flowers soon for the 3rd year in a row.

I also have stolons which can be cut off and planted separately in a pot. These root and grow rapidly into mature plants-a lot faster than from seed.

Darlingtonia begins growing after *Sarracenias* start growing here in early spring (about March). They seem to start a month later or so and all their pitchers for the season are produced in the spring. Flowers are also produced at this time as well. So, it is at this time that you should pay close attention to the needs of this plant because what you do to it now is important to what you will get later. The plant also goes dormant earlier than Sarracenia but its hard to tell because unlike its cousins, the pitchers remain green during the dormancy. Many of the pitchers are long-lived and frequently they survive not only the season but also into the following year when they begin to turn brown from the hood down and are easily replaced with new growth. The pitchers can also withstand some harsh weather conditions including freezing of the pitcher water.

If flowers are pollinated properly, seed is produced in October when the capsule changes color from green to light brown. Seed should be captured before the capsule splits open releasing most of the seed that falls to the ground. The seed can be stored in paper envelopes in the refrigerator until spring and are sown according to instructions by another member given here.

Darlingtonia Seeds

by

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Seeds of Darlingtonia are harvested at the end of September to mid-October and are stored in the refrigerator in plastic bags until spring. In the Spring, I use two methods of germination. First, I sow the seed on a peat-sand mix composed of 4 parts peat to one part sand#2 size. I sow the seed sometimes with and sometimes without Superthrive. I sprinkle seed on the surface of the peat-sand and water them very well. The other batch of seed are put in a solution of water and Superthrive (about 4 drops per cup of water) . I leave it this way until all the seed sinks to the bottom of the jar which usually takes about a week. I collect the seed through a strainer and then scrape the seed on the surface of the mixture of peat and sand. After putting the seeds on the peat & sand mixture. I set them in water about 3/4 full in full sunlight with 80% humidity. The seeds with Superthrive take about two weeks to germinate. The ones without Superthrive take a little longer about 3 - 4 weeks depending on your conditions in your growing area. You can also use live sphagum moss to germinate the Darlingtonia

seed it also takes 3 -4 weeks with that type medium or you can put a clear plastic cup for high humidity which might speed up the germination process a week eariler. I don't fertilize the seedlings but I treat with Superthrive solution once every two weeks. After they reach one-year old I don't use this hormone anymore since by now the seedlings have good roots. When they are three years old, they are transfered to pure live spagnum moss or 50-50 peat/sand mix.

I feel the key to growing these plants is filtered sunlight, good low conductivity water and allowing them a dormancy period. I leave the pot of seedlings in water all year. I spray-mist the seedlings twice a day: in the morning and in the evening. If they get any insect pests on them, I spray with Orthene pesticide which is very good for CP and doesn't harm the most sensitive plants.

Followup on Tuberous Drosera Propagation

by

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In CPN Vol 20, No 3, P. 68, I reported on my attempts at the propagation of tuberous droseras by detatching the newly emerging plant from the tuber at the start of the season.

It is now the end of the season, and my tuberous droseras have all been unpotted and stored in small plastic bags for the summer. Normally, I would leave the tubers in their pots over the dormant period, but as we will be moving before the next growing season, I have packed them ready to be moved.

On inspecting the pots, I found that I had varying results with my experiments. Some detached plants produced tubers, whereas others of the same species did not. I would suspect that it is necessary to detach the plants a little closer to the tuber, in order to remove more of the stolon connecting the plant to the tuber, but still leaving sufficient stolon with dormant buds on the tuber to allow a new plant to be produced by the tuber after disconnection of the previous one.

Another method that can also be sucessful is to detach the newly formed tuber from the plant just before the plant starts to die down. This method is probably most sucessful with noncolonising species, i.e. ones that form a single replacement tuber at the end of the season. Many colonising species die down before the new tuber is formed, relying on the succulent I underground rhizome to produce the tuber. The new tuber is removed from the plant as soon as it is of sufficient size, and treated as a dormant tuber. The plant is again repotted and kept growing with weekly foliar fertilizing, and a new but probably substantially smaller tuber should be produced.

As a result of my weekly fertilizing program, I found that I had a higher survival rate of tubers, a higher average multiplication rate, and a larger average size of tubers.

I would expect to have a higher percentage of plants flowering in the following growing season as a result of the increase in tuber sizes. I used an indoor plant food of the low nitrogen type. I mixed it at full strength as recommended for the watering of indoor plants, but applied the fertaliser as a foliar spray. The type of fertilizer (whether organic or chemical) does not seem critical, but a correct balance of major nutrients is important, and trace nutrients would be considered beneficial also. Be sure to use a low nitrogen type, not a high nitrogen type, which may not give such good results.

Something else that I discovered accidentally, was the ability of some species to produce additional tubers from a stolon. While I was aware that this often happens with growing plants, I was a little surprised at-my-findings when inspecting a tuber of *D. macrophylla*. I had packed the tuber with attached stolon before the stolon had died back, and when I next looked) several weeks later, I found several small "seedling" tubers along the length of the stolon. Hopefully these will survive to produce new small plantlets in the new growing season.

CLODS, Collectors, and Pseudo-Environmentalists

by

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I hate broken crayons. I had my first set when I was a youngster. I cherished them. When not using them in my colouring books or on the dining room walls, I lovingly kept thern stored in their carton, arranged by colour. I stewarded my later and larger sets even more carefully. Every crayon was in excellent shape; I was disgusted if any were broken, dull, or embarrassingly short. Complete sets were nearly mandatory. I had the mentality of a collector even as a child.

I am still a collector, but now of books, music, and gargoyles. But my collector's personality makes its most breathtaking appearance in my relationship with carnivorous plants. When my carnivorous plant menagerie was still in its adolescence, I was not a collector so much as an accumulator, a packrat. I wanted every plant I did not have and would never have dreamt of parting with a species (although I constantly exchanged propagules with my trading comrades). With time I became more discriminating, and now I only grow *Utricularia,Genlisea, Sarracenia,* and several other favorite plants. (All right, I admit that about 150 species are more than several, but I do grow fewer extras than I once did. Really!)

A ritual performed by most plant traders, and especially those haunted by the hobgoblin that turns them into collectors, is the design and creation of an inventory of the plants in the trader's possession. Yes, I have built such a list, and to see it is to glimpse the raw mania of a collector's mentality. For each plant I grow, my list tabulates its size, trading availability, a short description of the plant's characteristics, and any other minutiae I deem important. All these data are compulsively arranged in a strict format—an inconsistency in any parenthesis or comma used to delimit data fields would be intolerable. Spelling errors would be sacrilegious.

My *Sarracenia* collection, a modern day set of crayons, is complete, or so it was until a few years ago. Consider the genus—it is easy to have a complete collection of these plants. The usual laundry list of species and subspecies includes only a dozen or

so taxa; adding a few more entries for noteworthy giant or anthocyaninfree types brings the total to just under twenty plants. Some species contain races with differing pigmentation patterns, notably *S. flava* and *S. alata*. Collecting all these races, as well as the intermediate or "ancestral" specimens of *S. rubra* is more ambitious but the resulting ensemble of forty or more plants is more interesting—a complete collection is surely a worthy goal for the intrepid accumulator. But in the last few years I have watched these checklists become infinitely inflated by the arrival of a new face on the collecting scene—a quantum of trivia referred to as "location information". With location-information a plant like S. *minor* which (except for a giant type) is remarkably constant throughout its range instantly has many new types, all now distinct (at least on paper) and collectible. Suddenly my S. *oreophila* seems less valuable when *S. oreophila* (Boaz County, Alabama) or S. *oreophila* (Gravel Mountain) is in collections. And also I must void those nasty S. *purpurea* var. *purpurea* from my collection, because S. *purpurea* var. *purpurea (Cook* County, Illinois) is on its way. And I am not alone! On the internet and in letters I constantly hear from other growers who want plants with location-information. Surely, **C**ompulsive **L**ocation-information **O**bsessive **D**isorder (CLOD) is spreading, and the number of CLODS (CLOD Sufferers) is escalating.

Truly, location-information is useful when trying to identify difficult plants like *Utricularia* or *Drosera*. But I have observed that *Sarracenia* collectors are usually the CLODS with the most advanced cases. In the genus *Sarracenia*, locationinformation is only important when trying to puzzle the subspecific identity of *S. rubra* plants or perhaps naturally occurring hybrids. So why is the disorder reaching epidemic proportions?

I have four theories.

1)It may be that CLODS have an organic disease, one apparently transmitted by *Sarracenia*. But our esteemed Carnivorous Plant Newsletter coeditor-emeritus Dr. Don Schnell is a pathologist by trade, and I think if CLODS were carrying a disease surely we would have heard from him, just as we have heard about sporotrichosis. Of course, the eminent Dr. Don may be holding his editorial tongue if CLODS have a problem best treated by psychotherapy. If there are other CLODS in the Tucson Arizona area, would you like to meet with me? Maybe we could form a confidential support group?

2)Location-information adds another flavour to the enjoyment people extract from their plants. Earlier this year a friend and I watched a documentary about the animals that live by the Okavango river delta in Ngamiland, Botswana. The Okavango delta! I have a *Drosera* from there! While my mate was mesmerized by the lion cubs, all I did was try to see if they were trodding and tumbling upon *Drosera*. But does this sort of thrill carry over to *Sarracenia*? If you have *S. flava* in your collection, you already know it originally came from the southeast U.S.A. So why are the county, town, and road details so seductive to CLODS? Is the lure of Gulf County, Florida, really different from Santa Rosa's?

3)Possibly more people than I ever suspected share my mania for collecting. In this theory, traders accumulate plants because they love them and the plants are collectible; the added datum of location-information for each plant stimulates the collector's salivary glands. While it is relatively easy to acquire the twenty plants needed to complete a Sarracenia species and subspecies collection, obtaining a huge catalogue of plants each with location information indicating a unique origin is far more involved—attempting to achieve this goal results in a larger, more satisfying collection.

4)Finally, there is one more explanation I am often told by other growers. They say they want to have location-information for their *Sarracenia* so that when the plant goes extinct at that site then "at-least the plant will be in collections." When CLODS use this justification to explain their obsession with location information, it is very silly

on several counts. First, when a wetland community is destroyed, a few token plants from that site do not represent a viable form of damage control. A population of plants at a site consists of many individuals, each genetically distinct from the others. It is this seething mass of genetic diversity which enables plant populations to evolve over time; a few individuals extracted from a habitat do not possess this diversity. Furthermore, plants taken from the wild are usually ones deemed interesting by the collector. A plant hunter stumbling through a Savannah filled with green *S. flava* who finds a single plant with pitcher lids a lovely copper colour is going to dig up that plant—the very one most unrepresentative of the genetics of that population! Plant collecting is not an effective or even marginal form of conservation; if you want to save a bog you must save the bog itself, not just a few token plants. Very few individuals have the resources needed to grow a complete population of plants from each location and that is what would be necessary for this scheme to work. So really CLODS who claim to have conservation agenda are either misinformed or unwilling to face the reality of their collector's mentality. And consider this many times while admiring other growers' lists or collections, I have observed plants with location-information which unambiguously identifies that the plants have come from places protected by National Park status or affiliations with The Nature Conservancy. How does the conservation alibi explain the illegal collection of these plants? This explanation CLODS use simply does not hold water, so we are left with the previous three possibilities.

I have nothing against CLODS. My best friends are CLODS, I am one myself. But let us be realistic. If you have the mania then relish it for what it is—a simple obsession to collect, collect, collect. Adding a locafion-information tag as a new parameter gives you a reason to have a new item in your plant inventory—six different variants of *S. oreophila* are more fun than just one. Perhaps having a larger collection enhances your status among other growers, perhaps it makes you feel proud. Perfectly fine motivations. But please, I am tired of the worn old story that you have a valid conservation agendum—that CLODS are acting upon sincere and valid concerns for the plants. Are you interested in protecting these plants and wetlands? Write your politicians, donate time or money to conservation groups, be an activist. But if you have the compulsion, do not package it in green wrapping: no one is fooled and it is irritating in its duplicity.

The use of Tannic Teas in Carnivorous Plant Culture

by

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I must admit, when I first heard about the use of tannins at the 1994 Atlanta ICPS meeting, I was skeptical. Larry Mellichamp mentioned it as a key in getting the dark red forms of *Sarracenia alata* to get their characteristic black-red color. Since our clones always turned dark after the hot days of full summer sun, I assumed the pigment was related primarily to heat and sun levels. It wasn't until much later that I realized that the three factors were probably related.

My experiments began as an attempt to reverse possible calcium build up in *Nepenthes* growing media. After returning from a trip to Florida in Dec.-Jan. of 1996, I was alarmed at the yellow, weak condition of the plants and the higher than normal death rate of some rather hard to get seedlings. I sent numerous dying plants to the Plant Pathology lab at Virginia Polytechnic Institute; a puzzle faced us with their report of "no pathogens were found". My next guess was that the well had been slightly

contaminated with surface water and the pH of the media climbed with the introduction of calcium, (lime). Repotting the entire collection and propagative stock was a frightening thought. What if the media were drenched repeatedly with an acidic water? That should dissolve any solubles and restore an acid condition. I chose tannic and humic acids since *Nepenthes* must have a tolerance for these, given their habitat.

Peat moss and dried sphagnum were boiled for thirty minutes and strained to obtain a dark brown, pasteurized "tea". This was added to purified water, aerated and several test plants were given this brew twice a week. Slowly, over the course of a few weeks, the color began returning in the entire test sample. A yellow and dying *N. rajah* from tissue culture began to green up! Sphagnum started growing on the surface of the media. I started applying the peat "tea" to more plants until they were all getting it. Not only did they green up, growth increased, colors were brighter and pitcher size was rising surprisingly. This brew was giving results like a fertilizer without the fear of salt build up. Boiling doubtless released a complex mixture from the sphagnum and peat, rich in tannins, humic acids and polysaccharides. Seedling *Nepenthes* appear to survive better, probably due to the disinfecting quality of tannic acid and increased nutrient availability, at a lower pH.

Since I was making the "tea" anyway, I decided to test *Sarracenia flava* with it. For years, several clones that were deep red in the field were yellow-green with some veining in the nursery. These Florida plants grew in a depression surrounded by pine forest. The water filling the bog was hot and dark. Perhaps the hot summer sun was causing the tannins to dissolve at a high rate, making this race of *S .flava* red in Florida and seasonally darkening the *S. alata* in our nursery. Because commercial tea also is high in tannic acid, I also compared its effect on the same *S. flava* clone. All plants tested were genetically identical divisions from a single large plant. The plants were allowed to stabilize in containers for one year. All plants were yellow-green with some red veining.

After about three weeks, the plants getting the peat tea were noticeably more red than plants not getting the treatment. The plants getting commercial tea were also gaining red color, slowly but steadily. Ultimately, non-treated plants became the most pale. These were also not growing as quickly as those getting peat tea or commercial tea.

Keep in mind that these experiments are preliminary and may yield different results under different conditions. What exactly is happening has not been determined yet. Does the tea lower the pH so that nutrients become available for pigment and health? Do the tannins act as nutrients, becoming absorbed and metabolized into pigments and/or metabolic facilitators? Does the tea change the soil microorganism spectrum? I plan on conducting more experiments to determine the practical usage of tannic teas; my principal hope is that plant pathogens will be inhibited at low pH and high tannin levels while Nepenthes, Sarracenia and Dionaea seedlings will prosper. I am also trying tannic tea on Pinguicula planifolia, which is often difficult to maintain outside of its tannic habitat. So far, Cephalotus appears unaffected by peat tea and Heliamphora does not seem to respond to this treatment.

Here is the "recipe" I am currently using. Again, before using this, test a small sample under your conditions. Do not allow the brew to age; use it within a week and keep it cool. Make smaller batches if needed. I use a Coleman stove outdoors so my kitchen is not "soiled". Remember that acidic teas dissolve many metals! Use stainless steel or undamaged enameled vessels.

This is a concentrate which is added to water.

To 1 1/2 gallons of rain, distilled, or Reverse Osmosis treated water add:

One ball of dried sphagnum about the size of a grapefruit when slightly compressed in the hands.

One quart, slightly tamped, of new = unleached peat moss.

Yield is about one gallon. Boil these in a covered container for thirty to forty-five minutes, a slow simmer is fine. Allow to cool and settle for a while. Strain the particles out using nylon hosiery or other filter. Do not use paper filters as these clog quickly. Use clean, sanitized containers for transfer and storage. I strain the liquid while very hot into clean milk cartons. This way the container and brew are reasonably pasteurized. Because of the risk of burn, the beginner should wait until the tea is cool. There are tricks to effective straining which are best learned with cool tea. Keep the stream of tea being filtered to one side of the filter or nylon. If you pour too fast, the peat will form a cap on the filter and the brew will spill everywhere. Plastic containers are best for storage. Do not squeeze out the last bit by hand unless you are not worried about bacteria etc. washing off your hands and into the water! If your yield is much below one gallon, you may add slightly more water at the start of cooking. The pH of this concentrate, under our conditions, falls between 3.4-3.8.

I use 1-1 1/2 cup of this tea per gallon of water. A pH meter is handy for adjusting the ratio. The pH , as I've been using, should fall somewhere between 4.5-5.4. When watering, drench the media so water comes out the drain holes. Because this method adds chemicals, do not allow evaporation to concentrate, (over time), these chemicals in the soil. Drenching both adds and removes compounds. In nature, tannic waters are usually in motion, whether on the slopes of Mt.... Kinabalu or in the acid seeps of Florida. Adding air to the water/tea is probably smart; boiling or treatments usually remove oxygen from the water. Shake the cooled water in a partially-filled, clean jug or pump,(large scale), air into the treatment tank. Most CP benefit from aerated media. A weekly application is probably good to start your own experiments.

Freshly repotted plants probably won't benefit from this treatment; the media still has an acidic/tannic charge. Depending on watering habits, the media will eventually lose much of its acidity and this is when additional tannins, in the form of peat tea or possibly commercial tea, may hold promise for improving the health of carnivorous plants.

Currently, I am experimenting with tannic bark/ leaf mold/peat tea. The test concentrate is a pH of 3.4-3.8 and is being aerated and dripped over seedling Nepenthes. This very acid liquid may help protect the seedling from pathogens and nutrients present may be absorbed by leaves and/or roots. After three weeks, the test plants have not died or shown change. This test will probably run for 6-12 months before results will be noticeable, unless the test group dies!

Proceed with caution if you decide to experiment with tannic teas. Variables such as water quality, brand of peat or sphagnum and growing media will affect the performance of this method. My results are preliminary and based on our growing conditions. Begin with a limited test group before treating many plants. Compare treated and non-treated plants, preferably of the same clone. I would appreciate hearing from anyone having positive or negative results. Tannic teas may well be a useful technique in carnivorous plant culture.

The experimental growth trial for Royal Red VFT

by

Charles Clarke, 2/F,No. 128, Tai Po Tsai, Clear Water Bay Road, Kowloon, Hong Kong

As part of the application process for Plant variety Rights (PVR), it is necessary to conduct a comparative growth trial. This trial is a scientific experiment to show whether or not the variety for which PVR is sought is distinct from all closest known varieties of "common knowledge". At the completion of the trial, the results are analysed, a standard description is prepared and, along with the final part of the application form, the application is submitted to the PVR Office.

In his article about the saga of *D. muscipula* Royal Red, (CPN Vol. 25(3), p.90), Colin Clayton made the following claim about the comparative growth trial that I

conducted to determine whether or not Royal Red was distinct from other known varities of VFT:

"The law states that a qualified person must conduct or supervise trials to establish whether the plant being trialed is distinct from an already known type, before being granted P.V.R. It was here that the major mistake was made. The chosen qualified person - Dr. Charles Clarke - was given a red petioled V.F.T. and an all green V.F.T. to compare it with. After the scientific growing trials (growing the all red VFT alongside the green one), the conclusion was that the red V.F.T. was different from the green one-so the PVR was granted".

Here I would like to correct Mr. Clayton, who must either be unfamiliar with the conduct of scientific research, or has chosen to misrepresent the way in which I performed the trial. It is not possible to provide full details of how the trail was performed in the space available here, but these have been published in the Australian Plant Varieties Journal previously.

Briefly; the experiment was conducted at Exotica Plants' nursery in Queensland (this is acceptable under PVR regulations). No other common knowledge[1] varieties of *Dionaea muscipula* were known at the time in Australia, so the comparators chosen for the trial were drawn randomly from a pool of VFT which were either all green or had varying amounts of red pigment on the inner surfaces of their traps. These were labelled as "Typical" VFT. A sample of 30 typical plants was drawn at random from a pool of 37 plants. 23 plants of "Royal Red" were also used for the trial. The unequal sample sizes were not relevant to the statistical methods used. The plants were all potted in the same compost and pot type, and were grown together in rows. Only water was added (in equal amounts) to the plants during the trial. The trail lasted approximately three months, through the period of most active growth. Seasonal variations in growth habit were not considered, as they were not necessary to prove distinctness from the comparators.

Each major leaf part was observed on every plant to determine if it was green or red in colour. The distribution of colour in the leaf parts was always totally red or green: there were no examples of parts being part green, part red. The leaf parts examined were: petiole upper surface, petiole lower surface, trap inner surface, trap outer surface, trap margins, and the fringe "hairs" at the margins of the trap. The tone of the red pigment was noted. To test whether the samples were distributed independently of each other, a series of c^2 homogeneity test were performed, and significant differences detected for all characters except the inner surfaces of the traps and the trap margins. To support these parametric analyses, a non-parametric analysis (Mann-Whitney U-test) was also performed, based on the same data. This also showed a highly significant difference between Royal Red and the comparators.

This information was sufficient to show that Royal Red is distinct from typical VFT: the only common knowledge VFT known in Australia at that time. Whether these methods will be suitable for other comparisons is difficult to determine, and this must be considered in any future comparisons that were made: the trial was not designed to be universally adaptable to any comparison between varieties of VFT. Physical characteristics were not examined in this trial, nor was flower structure/ colour, as they were not relevant.

I feel that this trial was somewhat more complicated than being given one red-petioled VFT and one all-green one, and being asked to grow them together for a while, as Mr. Clayton claimed, and trust that this brief explanation of the methods used in the comparative growth trial goes some way to clarifying this matter. No doubt this article will raise more questions than it answers, but I would advise those who are curious to find out more to investigate PVR legislation in their country before making further claims or accusations in media such as CPN or the CP discussion group.

[1] Please note that "common knowledge" has a strict definition in PVR legislation, which is provided in my article about PVR which appears elsewhere in this issue of CPN.

International Carnivorous Plant Conference
May 16-20, 1997

hosted by
Atlanta Botanical Garden and the International Carnivorous Plant Society
Held at The Atlanta Botanical Garden, Atlanta, Georgia, USA

Proposed Agenda

Thursday, 15 May, 1997, 6.30pm
Welcome buffet & late registration

Friday, 16 May, 1997, 8.00am-6.30pm
6 Speakers from around the world including Prof. K. Kondo on 'Habitat management and in & ex situ conservation of cps in Japan' and Dr. Martin Cheek, RBG, Kew, UK on 'Diversity within the genus Utricularia'. Followed by poster session, plant sale (only artificially propagated plants) and tour of ABG cp collection

Saturday, 17 May, 1997, 8.00am-5.00pm
6 Speakers throughout the day followed by ABG cp collection tour

Sunday, 18 May, 1997, 8.30am-3.45pm
6 Speakers throughout the day

Monday, 19 May - Tuesday, 20 May, 1997
Two day field trip to visit cps in Georgia and surrounding states

Registration

Registration will cover welcome buffet, continental breakfast, breaks and box lunch and drink throughout the conference

*Registration **$65.00**

*Field Trip (limited to 50 places) **$120.00** (inclusive of accommodation, travel and food)

The conference organizers are not responsible for securing plant import/export permits and all delegates are responsible for travel, medical, and car rental insurance.

Please address inquiries to:

International Carnivorous Plant Conference
c/o Steve Baker, 5029 West Piedmont Circle, Conover, NC 28613, USA
Day: 704-322-2050 9am - 5pm, Evening: 704-256-7035 7pm - 10pm

Announcing New CPN Editors

At the close of 1996, I'd like to thank Don Schnell for his 25 years of work in founding the ICPS, getting the CPN started, and setting up many of the traditions and policies that will guide us for many years into the future. As was announced earlier this year, Don is retiring from his position as CPN editor to better enjoy a much-deserved retirement. I can't think of any better wish for Don than the traditional CP benediction of "good growing". Thanks Don!

The executive committee has appointed Barry Meyers-Rice and Jan Schlauer to replace Don on the editorial board where they will be joining Joe Mazrimas and Steve Baker.

Barry has been a frequent CPN contributor with tutorial articles on *Utricularia* and CP microphotograpy. Barry's flair for english will help make our journal more accessible to non-specialists. At one time, Barry had one of the most extensive collection of Sarracenia forms in cultivation, and has perhaps a dozen years of breeding experience in Sarr hybrids. Barry has a strong interest in habitat conservation, and will help keep our readership up-to-date in this area.

Jan Schlauer brings to the board his wide botanical expertise. He is the author of the exhaustively researched CP Worldlist, and is a specialist in CP taxonomy. Jan's key published in the last issue was a major re-organization and clarification of this complex genus. Jan will also be our first European editor - an important first step towards implementing the "International" in the "ICPS".

Both Jan and Barry are well-known and respected by the over 730 members of the on-line CP community. Their closer affiliation to the ICPS will help keep the two groups coupled and working together.

The first charter for the newly re-organized editorial board is to decide on the structure and policy of the board. I'm sure you'll be hearing from them as they develop new ways to better serve our readership.

Rick Walker

Cultivating CPs has many Surprises

by

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Keywords: Cultivation, *Dionaea, Sarracenia.*

I became interested in carnivorous plants in the late 60's, when I noticed and bought *Dionaea muscipula* kits at a supermarket. Unfortunately, the rhizome quality at that time was not adequateæthe "bulbs" molded or did not grow. I tried again in the mid/late 70's, when I bought one *Dionaea* package from Plant Oddities at the supermarket. That one grew well in a screened house porch. But, during the fall, when the temperature at night was 40°F, the plant either died or became dormant. I discarded it because of ignorance and disappointment. A growing hiatus occurred due to life's many unexpected twists, until I saw a catalog advertising CPs from Peter Pauls Nurseries, and at Home Depot's gardening section. I was determined to become a successful CP grower. The path took me from a reawakening in gardening "regular" plants, to where I am now a proud and happy member of the I.C.P.S.

I can concur with T. W. Hanley's writings on the difficulties finding reliable information on CPs (C.P.N., 24:35, 1995). It took persistence and research to obtain such facts. It also involved proper equipment, cultural-conditions simulation, complications and insect pest controls, as well as being alert to your CPs growth patterns. I come from the east coast where some people garden as a hobby. The library has an extensive gardening section and a few CP books. My thirst for knowledge continued until it led me to the I.C.P.S. and the Secretary/Treasurer, Kevin Snively, who graciously provided me with crucial requirements on CPs. Two nurseries, Peter Pauls and California Carnivores, provided pivotal advice on pest management and other CP factors.

When I first received my *Dionaea* from the former nursery, I put them in the house and inadvertently gave them inadequate light. The plants did not grow well. I then put them outside and moved them for optimal sunshine and they became stressed. I purchased a 10 gallon terrarium and kept them outside with decent ventilation-they further languished. I then put them on the porch with the same tank setup and there was little improvement. It seemed the more I tried to reproduce their native environment, the more my *Dionaea* said to me, "You are wrong"

After much thought and consultation, I got a glass top and double tube hood light system from a pet shop along with Grolux bulbs. My *Dionaea* were on their way on the road of recovery! Finally, a third side light was added with a timer. The plants began to behave normally and responded nicely! A foliar feeding with appropriately diluted Miracid for a couple of weeks accelerated their "nursing period". There was one casualty and that was in part due to the plant's retaining the inflorescence stalk for most of its life.

With such encouragement, I expanded my collection from Home Depot's gardening section. I have what I believe is a *D. rotundifolia, S. rubra, S. purpurea* ssp. *venosa,* and *S. purpurea* ssp. *purpurea* var. *heterophylla*. The latter was given to a woman acquaintance at a local college to repay professional favors; and is doing fine so far. The *S. rubra* also had to be nursed with misting and diluted fertilizer due to its droopy condition since its clear plastic cover was removed at H. D.'s nursery. Dead leaves were also pruned away. That plant recovered well. All plants listed were moistened with filtered wateræno plain tap water was used.

Setbacks then developed. I tried to grow *Dionaea* seeds with no luck. They must indeed have bright light and warmth to germinate. A mild white fly infestation occurred. I placed a marigold in the tank which seemed to help. Orthene was finally

used to resolve the problem. Worse was a moderate thrips invasion that apparently came later. I took stronger measures to obliterate this setback. I put my plants into another 10 gallon container and soaked them with water which had stood for two days to dechlorinate. The sundew was submerged in water for only two hours. The plants were taken out from that treatment and placed indoors with a 'regular' Grolux bulb. They were misted with an approximate 30% filtered water and 70% filtered rain water, twice a day for one week. They were sprayed with a more potent Orthene dose (1/4 teaspoon) with 1-3 drops of laundry detergent or/and 1-2 drops of lubricating oil with filtered water in another 8 ounce bottle. The plants were put back into their home tank and cleaned and fumigated with the specified pesticide The plants were also sprayed about two weeks later in the tank to completely end that nightmare. Whatever thrips were left sought refuge in the *S. purpurea* ssp. *venosa* pitchers, only to become a tasty meal.

At the same time, emergency surgery was done for two *Dionaea* in a salad bowl pot that had long fiber *Sphagnum* moss dressing which appeared to be the major cause of the problem. The plants root system was carefully taken out of the old medium and wrapped gently in separate paper towels, moistened with filtered water to reduce shock. A peat pot and a standard 3" pot were then used and the following was done: The long fiber Mossier-Lee *Sphagnum* moss was put in each of the pot's bottoms to serve as a drainage regulator, easier soil remover, and wick for the plants. The moss was then sprayed with room temperature filtered rain water and tap water combination as above. The moss readily absorbed the liquid without soaking in that product for 1-2 weeks. A shortcut was now discovered! Peat moss and New Era's shredded peat moss were added to both pots and misted accordingly. The *Dionaea* were planted in the pots and moistened with filtered water from the rain water spraying device. After two months of intensive care procedures consisting of cautious fertilizing/feeding program and misting/foliar spraying, the leaves of both plants survived to resume their vigorous growth phase. The peat pot *Dionaea* was given to a day care center to make room for another CP where so far it is still surviving. Further, all plants have napkins in their saucers to function as a sponge and root cushion for any root tips that would grow out of the pot holes. During the fall the sampled CPs had another mild onset of white fly problems, but this time most of the pests sought to hide in the *S. rubra* pitchers and become a meal. Later, unidentified egg cases or pupae from an insect pest appeared in the CP soil and were removed with tweezers. Strangely enough, the CP stopped growing until the problem was solved. About early November, a catastrophe literally hit the CPs The top cover accidentally was dropped on them! Luckily, there was little damage and what foliage was injured was pruned away. For the *S. purpurea* ssp. *venosa*, the ala was left to maintain its approximate photosynthetic processes level.

Due to the various shocks and complications of my CPs they were put into dormancy on January 22 of this year. Only the double tube light system is engaged with an achievement of 8 hours photoperiod. I will gradually increase that length of time on a weekly basis according to the calendar. The last battle will be to pot up the CPs in mid-March to early April, give them a shorter growing time, then put them into full dormancy with a lower temperature by November 15.

My CPs are given a diet according to their individual needs: Flies, spiders, small ants, nymph mole crickets, centipedes and occasional earwigs. To get them started or to treat sick plants, 1/8-3/16 teaspoon of Miracid was placed in an 8 ounce spray bottle. Using the pesticide bottle, about 3/16 teaspoon of Benomyl with a little sulfur was added to make an effective fungicide at a repeated dosage of 3-5 days intervals.

Overall, the results from this rollercoaster ride with my CPs are positive. Despite one plantlet of *Dionaea* that died due to lack of light, a *Dionaea* and *S. purpurea* have plantlets. A green *Dionaea* routinely produces more than the standard three trigger hairs arrangement-one time producing six bifurcate hairs on the two lobes! Two other *Dionaea* have occasional fourth hair development on the lobes with colorful traps, with one having bicolored (yellow and red) edge trapping hairs! The sundew readily flowered and produced hibernacula, while the *S. rubra* grows tall and happily.

So growing CPs is full of surprises and many of them can be pleasant ones!

ICPS SEEDBANK

Tom Johnson, Coordinator
PO BOX 12281
Glendale, CA 91224-0981
Updated November 11, 1996

Byblis gigantea
Byblis gigantea "Enneabba" Tall Plant
Byblis liniflora
(available as my seed matures—inquire)
Byblis liniflora Darwin red plants
Byblis liniflora ssp occidentalis
"Pago" Giant plants
Darlingtonia californica
Dionea muscipula
Nepenthes alata Phillipines
Utricularia dichotoma 'Esperance'
U. gibba
U. subulata
S. flava
S. flava "purple throat"
S. flava "green with yellow tops"
S. leucophylla
S. leucophylla white and red tops
S. psittacina
S. purpurea purpurea
S. rubra
S. X alata x leuco
S. X flava x (alata x leucophylla) Ltd
S. X flava X oreo
S. X leucophylla x (flava x leucophylla) Ltd
S. X (leucophylla x flava)
x (leucophylla x rubra) Ltd
S. X (oreophila x purpurea
purpurea) x self
S. X purpurea x alata Ltd
Drosera adelae
D. aliciae
D. burkeana
D. burmannii 'Berwah, Qld'
D. burmannii Giant Red,
Hann River WA D. capensis
D. capensis "green"
D. capensis "wide"
D. capensis "white flower"
D. capensis "red"
D. capillaris
D. dielsiana
D. filiformis filiformis
D. intermedia
D. macrantha macrantha
D. marchantii marchantii
D. montana Caraca BR
D. spatulata
D. spatulata Hairy Sepals,
Gympy Qld
D. spatulata pink flower
D. species Magaliesburg
D. X dielsiana x Sp. Transvaal
D. X thelocalyxiana (burm X sessilfolia

All seed contributions are greatfully accepted. Please forward to the above PO Box. Please protect the seeds from postal abuse. I use bubble wrap, although it does require an additional eleven cents in postage (within US). Note: Ltd. means the seeds are in very limited supply.

Please mail comments to: tjjohns@primenet.com
You can also visit Tom's Web Page at
<http://www.primenet.com/~tjjohns/index.htm>
to get the must up to date Seedbank List.

PLEASE INCLUDE A SELF-ADDRESSED-STAMPED ENVELOP WITH ALL U.S. CORRESPONDENCE
($.32 Postage for seedlist ; $.43 when ordering seed)
IRC or $1.00 if foreign $1.00/packet Please list substitutes.

Literature Review

Kiat, T.W. and W.C. Lum. 1996. Aerial pitchers of *Nepenthes ampullaria* Nature Malaysiana 21:12-14.

The authors review the literature in which it is noted that *N.ampullaria* rarely or never (depending on author) has aerial or climbing pitchers as do other species of the genus. As an example, the ground and climbing pitchers of of *N. rafflesiana* are pictured. The authors note that in plants they have cultivated in Malaysia have had intermediate or nearly aerial pitchers (This reviewer has also noted these in plants cultivated under glass in Virginia). After extensive searching through many natural areas where *N.ampullaria* was abundant, the authors did indeed find very rare individual plants with aerial pitchers. Further studies attempting to relate these rare aerial pitchering stems to any other ecologic or genetic characteristics were apparently not done. The authors mention that the aerial pitchers were useless for purposes of trapping prey since they were tipped in growing, emptying any contents. Unfortunately, the photos of these aerial pitcher stems were entirely inadequate and we hope to see better ones some other time.

Sullivan, JM. 1995. *Utricularia subulata* in Missouri. Missouriensis 16:39-41 .

While visiting a Nature Conservancy property in Missouri called Shut-In Mountain Fens, the author's botanical club discovered a new state record, *U subulata* present in all three fens of the location. *U. macrorhiza* and *U gibba* have been recorded in the state previously. U *subulata* is on Steyermark's list of plants that might possibly be discovered in Missouri since the species occurs in neighboring Arkansas. As an interesting sidelight, while the group was confirming the find by presenting a specimen to the herbarium of the Missouri Botanical Garden, the keeper found an error while leafing through the genus sheets-- A plant mislabeled *U gibba* from another fen a few miles away from Shut-In Mountain was in actuality U *subulata !* Other records of *U ,gibba* in Missouri are apparently still correct.

News & Views

Don Schnell, (Rt. 1, Box 145C, Pulaski, VA 24301)

Don sends the following. Readers will recall the recent discussion about using smoke to promote germination of certain stubborn CP seeds such as *Byblis,* tuberous Droseras, etc.(See CPN 25:49, 1996). Briefly, it was originsily noted that seeds germinated much more readily if paper or debris was burned on the surface of the moist soil with the sown seed in place. One supposed the heat and steam helped. Botanists in the fynbos of South Africa first surmised that it was possibly the smoke, not the heat and steam, that expedited germination. Experiments with smoke of burning grass and brush wafted over the pots, or indeed the use of water through which smoke had been bubbled, was as helpful. One could make and store 'liquid smoker or Smoke Waters (That is not something out of the '60's!). Now, the Kirstenbosch Botanical Gardens in RSA have dried concentrated smoke water on disks of paper for easy use and storage. One simply swishes a disk around in 50 ml of water for a few minutes to reconstitute the solution, then soak your seeds in it for 24 hours. The disks can be stored in the fridge. It will be interesting to see if they analyze what it is that has been chemically created in the conflagration that acts as a germination promoter. If you wish a sample of proven smoke paper disks, send $5.00 US for a packet and instructions to: Frank Wolpert, 10 Helderberg, Belmont Avenue, Oranjezicht, Cape Town, 8001, Republic of South Africa.

Artists, Authors, Correspondents, and Photographers Index

Is the Most Beautiful *Drosera* in the World Brazilian?

by
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Drosera villosa is usually considered the most beautiful Brazilian ***Drosera***, mostly because it is the only Brazilian species of ***Drosera*** known among CPers. Few people grow ***D.villosa*** and even fewer have ever even set eyes on any other native Brazilian species such as ***D.graminifolia***, ***D.montana***, or ***D.communis***. I have traveled much around Brazil in search of CPs and have seen all of the known (plus a few unknown) native ***Drosera*** species, except for those native to northern Brazil, in the vast Amazon region and in the highlands of the northern borders (like the tepuis of the Roraima highlands). There are quite a few fantastic species in Brazil, like ***D.chrysolepis***, which forms stems up to 40cm in height and the pretty ***D.sessilifolia***, a close relative of ***D.burmanni***. Yet ***D.villosa*** still beats them all when it comes to beauty. It is quite a thrill to find a wild colony of ***D.villosa***, the rosettes full of strap-shaped leaves (which under strong sunlight may become a deep wine-color), setting on a carpet of green mosses. The rosettes are usually up to 6 or 7cm in diameter, but I have found plants up to 13cm across.

D.villosa grows from the state of Rio Grande do Sul in southern Brazil to the state of Bahia in the northeastern part of the country. Along this species' vast range, there are various different forms which will surely become new varieties, subspecies, or even separate species in the future. ***D.villosa*** will pass through a small taxonomical revolution, hopefully in the near future, as all these forms are sorted out. One of these new varieties was discovered in northern Minas Gerais state around the small village of Grão Mogol, just east of the city of Montes Claros. My first contact with this new

variety was at the University of São Paulo Herbarium (SPF) in early '91, but I only went to see them in the wild in mid '94.

The village of Grão Mogol was founded by diamond miners and was supposedly named after a famous Asian diamond. Much of the highlands around Grão Mogol has been completely overturned by the devastating methods employed by the miners over the past century or two. Luckily, the local vegetation is extremely hardy and eventually covers up the disturbed areas, though the signs are never completely erased. It is called "campo rupestre" vegetation here in Brazil and consists mostly of low plants growing on top of sandstone highlands on rocks and/or in sand.

Like many other places I dream of visiting in Brazil, Grão Mogol is in a very poor and isolated region, not to mention far from my home in São Paulo, thus going alone by car was out of the question. I spent a few years traveling to other places of easier access, often with organized groups, until I got the experience (and courage) to go to Grão Mogol on my own. I also had to get accustomed to spending long hours or even days on old busses, without anyone to talk to and help pass the time.

I agree it is dangerous to go hiking alone over unknown mountain ranges, but most places I want to go to nowadays are not known to tourism agencies and unfortunately I have not yet found a hiking companion patient enough to wait around constantly as I stop to photograph, herborize, and collect live CPs. Also, after a few years of hiking experience, it is harder to find people who can keep up a quick, steady pace all day long over rocky terrain. My addiction to CPs keeps me blind to all the adversities and pushes me on, the experience and courage accumulating. I have luckily always had a good sense of direction which never (well, hardly ever) lets me down. I usually just choose a place on a map, get the necessary busses to arrive there, and then I just start hiking up the mountains.

I had never traveled as blindly as I did on my first trip to Grão Mogol in June '94, without knowing what to expect of the place, where to stay, and even how to get there! Luckily, the only real difficulty I had was finding this new variety of ***D.villosa***. Location data accompanying herbarium specimens were as good as they could be, which too often is far from enough. I was not sure in what type of habitat to find these plants and I spent a few difficult hours crossing thick, prickly vegetation and dying of thirst (it was tremendously hot and sunny and my water soon ran out) before I finally found this new ***D.villosa*** (and water) just when I was about to give up the search.

This new variety will soon be formally published and named ***D.villosa*** var.***graomogolensis***. The herbarium specimen had seen were spectacular, but still did not prepare me for what I found. I have tried to explain (unsuccessfully) to a few corespondents the emotion I felt when I discovered these plants. This is surely the most wonderfully beautiful ***Drosera*** known in Brazil and maybe the world! Though there are magnificent South African and Australian species, these have annual cycles and completely disappear for a few months of each year, while ***D.villosa*** maintains its rosettes full of leaves all year round.

The most outstanding feature of this new variety is that it slowly builds a column of dead leaves as the stem grows upwards to around 10cm or 15cm in height, while the typical form is rather prostrate. The rosettes are very compact, up to around 9cm in diameter and are a magnificent deep-red color. In strong contrast are the snow-white hairs covering the undersides of the leaves (which are also present on normal ***D.villosa***) and seen on the curled-up leaves in the center of the rosettes. I found these plants at a grassy seepage on a hillside at around 700m of altitude, growing by a small rivulet and on the edge of a few rocks jutting through this marsh. They formed extremely compact groups, which only helped multiply the magnificence of the individuals. Many ***D.villosa*** var.***graomogolensis*** were growing into the rivulet,

with the rosettes bobbing on the surface of the water and roots anchoring the trailing stems, which in these conditions reached over 30cm in length!

At this same site I also found a few ***Utricularias***, ***Genlisea aurea***, ***G.repens***, plus three other species of ***Drosera***. This was the first site where I found four ***Drosera*** species growing together in Brazil. Another surprise was that I found my first native natural ***Drosera*** hybrid, a cross between ***D.montana*** and a new species which I discovered at the Emas National Park in '91 (see CPN 21:3) and which I have been calling ***D.*** sp."Emas". I ended up spending four hours at this site and only left because it was already getting late and I still had a long way to walk back.

In August, a few of the ***D.villosa*** var.***graomogolensis*** I had collected two months earlier began flowering and I decided to return as soon as possible to Grão Mogol to catch these plants flowering in the wild. In September I was back there, once more aghast as I walked around and drooled over the fabulous ***D.villosa*** var.***graomogolensis***, now with red peduncles reaching 50cm in height and bearing large pink-lilac flowers over two centimeters in diameter! Unfortunately colors do not carry on too well into cultivation, due to weaker sunlight, and native ***Drosera*** soon turn greenish. Even the flowers are lighter in color under artificial conditions.

During this second trip to Grão Mogol, I witnessed pollination of a native Brazilian ***Drosera*** in the wild for the first time. This was being carried out by a small, green bee on flowers of ***D.graminifolia***. The following day I saw this same species of bee plus common honeybees buzzing around ***D.montana*** plus ***D.villosa*** var.***graomogolensis*** flowers and was even able to photograph the green bee on a flower of the latter.

A few months later, as soon as my classes were over for the summer vacation in December, I was off to northern Minas Gerais again. I returned to Grão Mogol, but I first went to two even tinier villages just south of Grão Mogol: Itacambira and Botumirim. My main objective was to find more ***D.villosa*** var.***graomogolensis*** and to collect their seeds. Though I searched extensively around both new places, I only turned up one site with this species at each place (like at Grão Mogol).

At Itacambira I found a large colony growing in slightly humid sandy soil on a hillside at around 1250m of altitude, under the semi-shade of ***Lavoisiera*** sp. (Melastomataceae) bushes up to 160cm in height, a habitat quite different from the one at Grão Mogol! The ***D.villosa*** were concentrated around the bases of these bushes and a few other plants, where it is probably more humid. As an unfortunate result of the shadier conditions, the ***D.villosa*** were all green or reddish-green, and not beautifully colored like the ones at Grão Mogol.

Water flows abundantly all year round at the ***D.villosa*** site in Grão Mogol, even though most natural springs disappear during the winter in this region. Looking at this new site at Itacambira, I would have guessed it dried up totally during the dry season, if it were not for the presence of ***D. villosa*** var.***graomogolensis***. Examining their stems, I was surprised not to find any burned leaves (which I later observed on stems of the plants found at Botumirim), showing that bushfires normally do not pass through this site during the dry season. A curious detail is that the leaves of that ***Lavoisiera*** sp. are shaped very amazingly like VFT traps!

At Botumirim I only found a small colony of ***D.villosa*** var.***graomogolensis*** growing next to a stream at around 1300m in mushy soil composed mostly of decaying organic matter mixed with some sand. These were not very big, but were nicely colored in their sunny location. Wildfires had swept the Botumirim highlands a few months earlier and had obviously damaged quite a few CP populations, including these ***D.villosa***. Here most of the plants were young individuals growing from the roots at the base of stems killed by wildfires during some previous dry season. Even these young ones showed signs of burned leaves on their stems from more recent fires.

The dry season was strong in '94 and I saw places where even ***Sphagnum*** had been burned!

Unfortunately I was not able to explore the Botumirim region too well due to heavy rains. In the resulting fog, I got lost like I never had before in my life and wasted half a day trying desperately to find my way down from the mountains and back to Botumirim. I almost spent a cold, wet night on top!

Back at Grão Mogol for the third time in six months, I was sad to find my favorite CP site in Brazil full of sad-looking ***D.montana*** and ***D.villosa*** var.***graomogolensis***, probably a result of the pouring rains which had been beating down on them (and me) over the past few days, though maybe they were still recovering from the energy spent during the flowering season. I collected lots of ***D.villosa*** peduncles at Grão Mogol and Itacambira, but sadly these were long dead and all spent of seeds. Better get there earlier next year! I did notice that my plants in cultivation produced practically no seeds at all and it seems like even the wild ones produce few seeds. Luckily though, I have discovered that it is not difficult to reproduce ***D.villosa*** var.***graomogolensis*** by leaf cuttings.

So now, after reading about ***D.villosa*** var.***graomogolensis*** and seeing a few pictures, do any of you have a better candidate for "Miss ***Drosera***"?

Figure 1. *Drosera villosa* var. *graomogolensis* 1250 m. at Itacambria, Brazil. Note marcescent leaf growth pattern. Photo by Fernando Rivadavia. See article in this issue.

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Figure 2. *Drosera villosa* var. *graomogolensis* flower being pollinated by small green bee at Grao Mogol. Photo by Fernando Rivadavia. See article in this issue.

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Goodbye Don

by
Joe Mazrimas, 329 Helen Way, Livermore, CA 94550

I would like to extend my thanks to Don for all the good and exciting times we had putting together a magazine that unites all of us in this CP adventure. Through the years we had some remarkable interaction despite the fact I never met Don personally. I will miss his insight and expertise on our favorite subject. Hopefully, he will not abandon us and we will read his words of wisdom in these pages in the near future.